

**A new species of the genus *Cubacubana*
(Insecta: Zygentoma: Nicoletiidae)
from a Mexican cave**

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Abstract.—A new cavernicolous species of the genus *Cubacubana* (Zygentoma: Nicoletiidae) is described. This species is probably more distant from any other species of this genus described until now.

The genus *Cubacubana* was originally described with three cavernicolous species from Cuba (Wygodzinsky & Hollinger 1977), although Espinasa (1999b) has proposed that one of the species is of the genus *Anelpistina* (Silvestri, 1905). In Wygodzinsky's paper, he asserted that the Mexican fauna of free-living and cavernicolous Nicoletiines is very rich and quite possibly species of *Cubacubana* will also be found on the mainland. Later another *Cubacubana* species was described from Aruba island (Mendes 1986) and finally a species was described from México, *C. mexicana* (Espinasa, 1991), thus fulfilling Wygodzinsky's prediction. Further exploration of caves in México has shown that organisms of the genus *Cubacubana* are actually abundant (Espinasa 1989).

The new species has a series of characters that permit us to define it as a cave adapted troglobite such as the overall large size, enlarged appendages, and surface crawling as opposed to occurring under rocks. Its presence in at least two different cave localities can be explained because they are within the same karstic area and probably are a single underground system (Diamant-Adler 1991).

Materials and Methods

Detailed descriptions of the caves can be found in the "Tepeyollotli" bulletins of the

SMES speleological society (Diamant-Adler 1991). Organisms collected were crawling on the cave's floor. They were placed into a vial with 96% ethanol. Dissections were made with the aid of a stereo microscope and the different parts of the body were mounted in fixed preparations with Hoyer's solution. All illustrations were made with aid of a camera lucida attached to a compound microscope.

Types were deposited in the following collection: LESM-DB-MEX (Laboratory of Ecology and Systematic of Microarthropods, Department of Biology, Faculty of Sciences, UNAM, México D.F.). Catalog number: ZYG-5.

Cubacubana asymmetrica, new species Figs. 1A–G, 2A–F

Type material.—México, Puebla State, Coyomeapan municipality, Tepepa, "TP4-13" Cave (780 meters deep and more than 5 kilometers long). Ex soil, 23 Dec 1990, L. Espinasa col. Male holotype, two male paratypes and five female paratypes.

Other localities: México, Puebla State, Coyomeapan municipality, Huitzilatl, "Xaltégoxtl" Cave (60 meters deep and more than 2 kilometers long). Ex soil, 3 Jan 1991, R. Espinasa col. Two males and two females.

Description.—Maximum body length 22.5 mm. Maximum length of antennae 34

mm, of caudal appendages 35 mm. When complete, antennae measure $3\times$ length of body and caudal appendages $2\times$ length of body. General color light yellow to white. Macrochaetae simple or forked.

Head with approximately $5 + 5$ macrochaetae on border of insertion of antennae. Antennae of male with 83 preserved articles; distal articles very slender and long, with internal sensory organs similar to *C. negreai* (Wygodzinsky & Hollinger, 1977). Basal article of antennae in males without projections. Pedicellus of antennae of male elongate as shown in Fig. 1B, with clusters of unicellular glands arranged in 5 groups. In adults, right pedicellus bigger than left and longer than basal article (Fig. 1B–C). Female basal articles of antennae simple. Mouthparts very elongate (Figs. 1A and 2A); galea almost as long as lacinia (Fig. 2A), with 2 apical conules of different width (Fig. 2B). Two teeth on lacinia and on bigger tooth's base, an extra very small hyaline tooth. Labial palp long and slender, apical article one and a half times longer than wide and subtriangular (Fig. 1A). Labium and 1st article of labial palp with macrochaetae. Mandibles with 4 macrochaetae, without small pegs on the bigger tooth. Legs elongate; hind tibia approximately 8–9 times longer than wide. Leg chaetotaxy as in *C. mexicana* (Espinasa, 1991). Claws of normal size.

Cerci of male with a very short basal article, a very long 2nd one bearing numerous spines, followed by numerous short articles of simple chaetotaxy. In adults, the very long article is slightly curved and with spines, all inserted on tubercles and roughly of the same size and form (Fig. 1D–E). The spine row does not reach base of article. Female cerci simple.

Thorax with short macrochaetae: $2 + 2$ on anterior border of pronotum, $3 + 3$ macrochaetae on nota's lateral borders, and $1 + 1$ submedian distinct macrochaetae apart from several setae of varied sizes on nota's posterior borders.

Urotergite X of both sexes with a small

degree of prominence and posterior part short in length, approximately one fifth its width, with a shallow emargination (Fig. 1G), posterior angles with a few macrochaetae of varied sizes, length of inner macrochaetae almost equal to distance between them.

Abdominal terga and sterna as in other members of genus. Abdominal sterna II–VII subdivided into coxites and sternite. Sterna VIII and IX of male entire. Urosternum III and IV of male without modified coxites. Urosternum VIII of male shallowly emarginate on posterior margin, angles of emargination pointed to slightly rounded. Urosternum IX of male straight behind, without modifications (Fig. 1F). Stylets II–VIII with two macrochaetae and an extra subapical pair. Stylets IX larger than others, with four macrochaetae and the extra subapical pair. Terminal spine with small teeth. In males and females styles IX without spines.

Penis and parameres as shown in Fig. 1F. Parameres very short, broaden slightly at base on inner face, and attaining only $\frac{1}{2}$ of stylets IX. Surface of parameres with short setae, apical portion with numerous very short setae. Subgenital plate of female subelliptic or parabolic slightly rounded, slightly longer than wide. Ovipositor surpassing apices of stylets IX by a distance equal to $\frac{1}{4}$ the length of stylets (Fig. 2F). Gonapophyses with approximately 17 articles.

Post-embryonic development as in Tables 1–2, Figures 1D–E and 2C–F. Length of body can be obtained from the length of hind tibia according to the next formula:

$$\text{Length of body} = (5.57) \text{ length of hind tibia} + 1.65 \pm 3$$

Etymology.—*asymmetrica* = Asymmetric. Makes reference to the asymmetric size of pedicellus in males, the right one being longer than the left.

Remarks.—*Cubacubana asymmetrica* can be differentiated from other members of the subfamily Cubacubaninae by the following characters: Species of genus *Texo-*

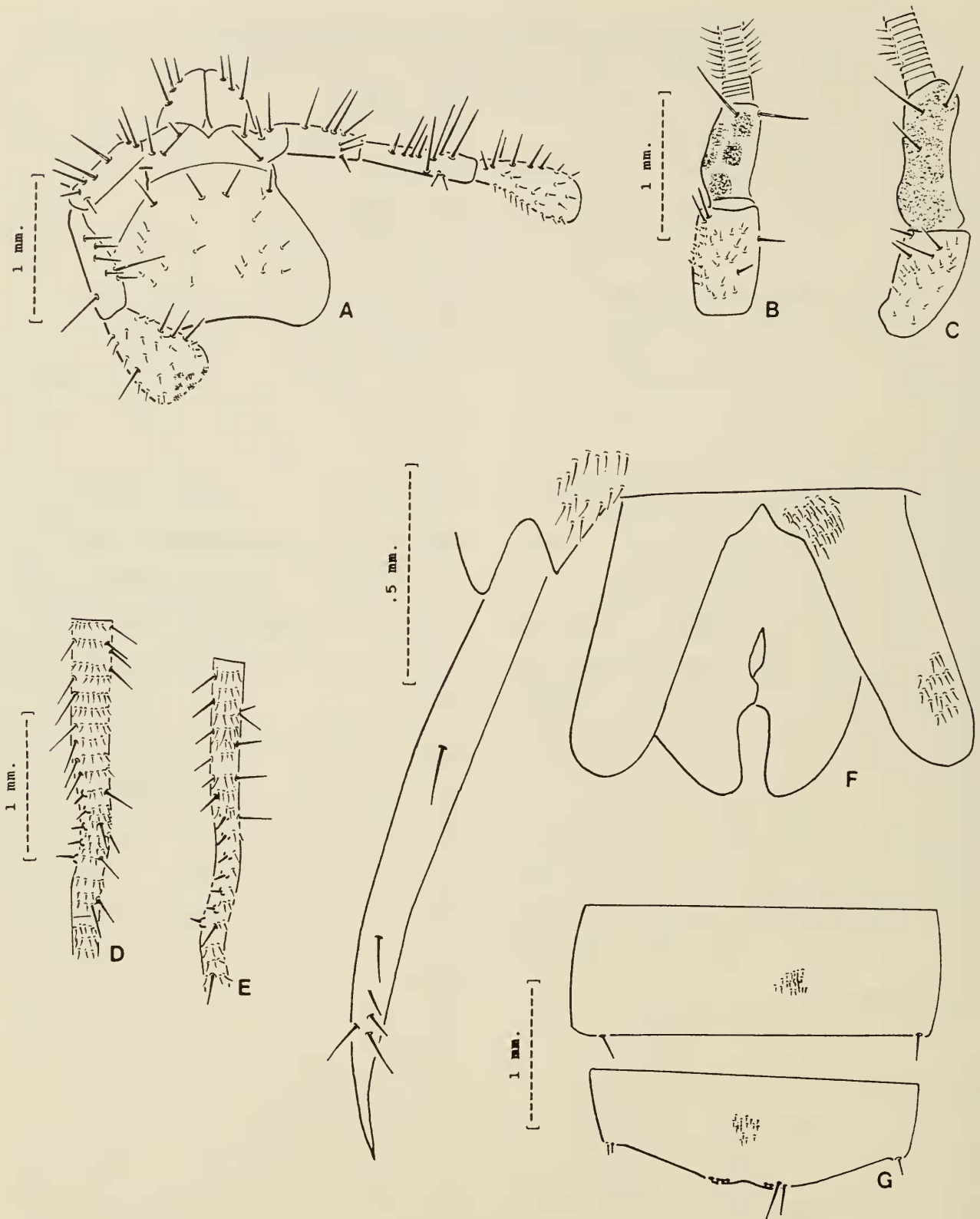


Fig. 1. *Cubacubana asymmetrica* n. Sp.: A, labium with palp; B, Male. Basal portion of left antenna; C, Male. Basal portion of right antenna; D, Juvenile male. Basal portion of cercus with five spines; E, Adult male. Basal portion of cercus with seven spines; F, Male. Genital area; G, Urotergum X.

reddellia (Wygodzinsky, 1973) or *Squamigera* (Espinasa, 1999a), have scales, which are lacking in *Cubacubana*. *Allonicoletia* (Mendes, 1992) lacks stylets in urosternite II, which are present in *Cubacubana*. *Neon-*

icoletia (Paclt, 1979) has a rugged endopodium, absent in *Cubacubana*. *Prosthecinna* (Silvestri, 1933), has a submentum with conspicuous lateral lobes bearing numerous glandular pores, absent in *Cubacubana*.

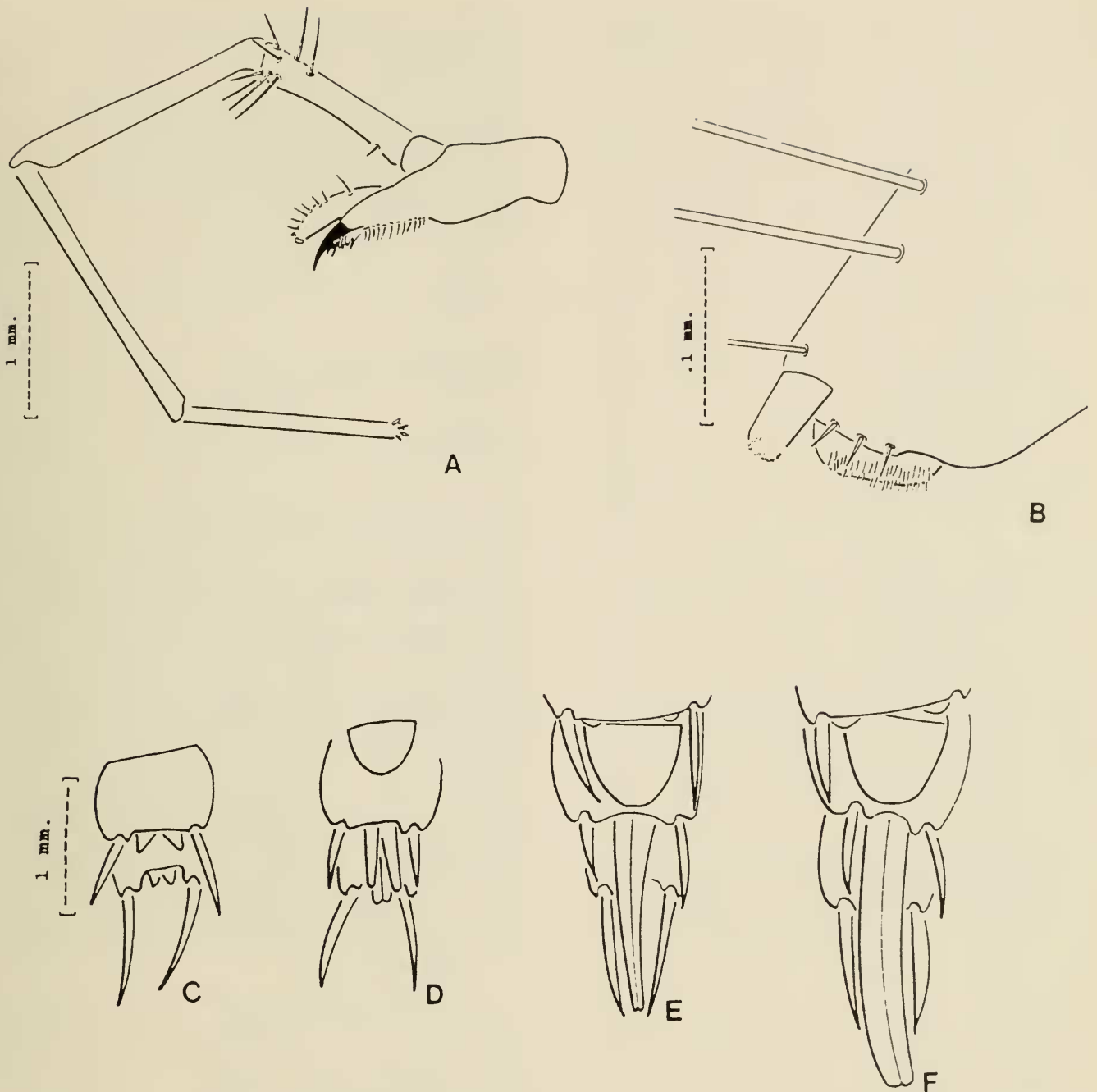


Fig. 2. *Cubacubana asymmetrica* n. Sp.: A, Maxilla; B, Apical portion of maxilla; C-F, Post-embryonic development of female. Ovipositor and subgenital plate. Length of ovipositor in Table 2 as follows: C = $-\frac{1}{2}$, D = -1, E = 0, F = $\frac{1}{4}$.

Most species of *Anelpistina*, have articulated submedian appendages in urosternite IV of males, which are absent in *Cubacubana*. From the two species of *Anelpistina* that lack such appendages; *A. decui* (Wygodzinsky & Hollinger, 1977) and *A. inappendicata* (Espinasa, 1999b), and from the described species of *Cubacubana*; *C. ramosi* (Wygodzinsky, 1959), *C. negreai* (Wygodzinsky & Hollinger, 1977), *C. arubana* (Mendes, 1986), and *C. mexicana* (Espina-

sa, 1991), *C. asymmetrica* differs by the posterior part of urotergite X, which is short in length (one fifth the width of the urotergite), while in the other species it is longer (approximately one half to one third). Males are also differentiated by long pedicellus (twice or more long than wide) and also by the asymmetry of adults, in which right pedicellus is bigger than left.

Cubacubana asymmetrica can be further differentiated from *C. mexicana*, the only

Table 1.—Post-embryonic development of male *Cubacubana asymmetrica*.

Length Hind tibia mm	Length both pedicellus		Spines in III urosternum		Emergination urosternum VIII		Sensory cones urosternum IX		Spines in stylets IX		Parameres vs. stylets IX		Spines in Cerci (Fig. 1D-E)		
	Equal	Unequal	No	Yes	No	Small	No	Yes	No	Yes	1/3	1/2	No	5	7
Cave of "TP4-13"															
1.50	+		+		+		+		+				+		
2.74	+		+			+		+	+			+		+	
3.10		+	+			+		+	+			+			+
3.18		+	+			+		+	+			+			+
Cave of "Xaltégoxtl"															
2.74	+		+			+		+	+			+		+	
2.88	+		+			+		+	+			+			+

Table 2.—Post-embryonic development of female *Cubacubana asymmetrica*.

Length hind tibia mm	Ovipositor surpassing apex stylets IX (Fig. 2C-F)			
	-3/2	-1	0	1/4
FEMALES:				
Cave of "TP4-13"				
1.74		+		
3.45				+
3.45				+
3.49				+
Cave of "Xaltégoxtl"				
1.76	+			
2.89			+	
3.16				+

other Mexican *Cubacubana* species described, by its longer antenna (three times the length of the body instead of one and a half), caudal appendages (two times the length of the body instead of slightly more than one), maxillary palp (distal article 11 or more times longer than wide instead of less than ten) and legs (hind tibia approximately eight to nine times longer than wide instead of six). Furthermore males do not have spines or cones on urosternum III and IX or on stylets IX. Gonapophyses of females have fewer articles (approximately 17 instead of 22).

Cubacubana asymmetrica shares characteristics present in other genera, such as the curvature of cerci of *Prosthecina addititia* (Wygodzinsky, 1951), or some type of asymmetry in the pedicellus as in *Coletinia subterranea* (Silvestri, 1902) and *Coletinia asymmetrica* (Bach de Roca et al., 1985). These characters are probably the result of convergent evolution.

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